



Virginia Pollution Prevention Case Study Steward School – Bryan Innovation Lab

Project Information

The Steward School is an independent state accredited school for Pre-Kindergarten through 12th grade located in Richmond, Virginia. The enrollment for the lower, middle, and upper school combined is approximately 600 students. The school was built in 1972 and the Bryan Innovation Lab at The Steward School was built in 2013 to serve as a learning lab to promote student and staff awareness and understanding in the areas of energy and resources, health and wellness, and the interaction of the built and natural environment. The mission of the Bryan Innovation Lab is to inspire and educate students, faculty, staff, and the greater Steward community by connecting global thought leadership with interactive problem-solving opportunities in order to discover, engage, and excel in the rapidly changing world. The Steward School believes that the unique hands-on learning environment of the Bryan Innovation Lab will enhance and strengthen each student's enthusiasm for learning, adaptability, and critical thinking skills.

Environmental Challenges and Opportunities

The Bryan Innovation Lab was made possible because of a financial gift from the family of a student. The school knew from the beginning that the funding would be used to create programming that expanded the school's focus on innovation, research and design. They needed a facility that provided hands-on learning environments, both inside the building and outside in gardens and natural areas. Additionally, the school wanted to reverse its footprint on its immediate environment, as the campus extends across 37 acres and the school had regularly added new buildings.

The Bryan Innovation Lab was five years in the making before it opened. Because the environmental footprint was part of the planning process from the beginning, the architect was able to ensure that the vision that the school had for the facility was made into reality. Although the school decided not to seek LEED certification because of the cost, the Bryan Innovation Lab was built with LEED standards as part of the considerations.

Implementation of the Program

Building Design

The Bryan Innovation Lab planning began before the facility was even built, allowing The Steward School to include a variety of features that are not only designed to be environmentally friendly, but also educational. The Lab has a geothermal heat pump used in tandem with the HVAC, photovoltaic power generation from an array on the roof, radiant floor heating for winter months, and a solar hot water system that uses the sun's energy to heat water for the building. In addition to these energy-saving design elements the Lab also has two 2,500-gallon underground cisterns to collect runoff water. This water supplies five 250-gallon above ground cisterns that are spaced throughout the garden and used for landscape irrigation. The curriculum and facilities stress the importance of a balanced energy portfolio and the need to properly manage resources. The building's mechanical systems are exposed, labeled, and metered to generate real-time data for students to investigate how energy is being generated and consumed.

The school's curriculum includes study and exploration of energy and natural resources. Student analysis of the Bryan Innovation Lab's energy usage offers real-life data that illustrates how technology and behavior can impact the use of energy. The ways in which resources are conserved can be seen in a multitude of systems on the Bryan Innovation Lab grounds. In the "Core" of the Lab, the intentionally revealing architectural and mechanical design make the distribution and use of energy understandable and teachable. Energy production and savings data is collected using smart grid technology on a dashboard application in the Lab. An example of a lesson tied into this element of the Lab is to have students measure and compare the Lab's energy use with the previous week's numbers and brainstorm energy-saving solutions.

Another environmental consideration that the school addresses is environmentally friendly purchasing. The school buys their supplies locally whenever possible and makes an effort to use local artisans, like the one who crafted benches for two of the classrooms from the wood that was cut while clearing the land for the Bryan Innovation Lab. Many of the Lab's design choices were made specifically to minimize the impact on natural resources, such as the decking material outside the Lab, which is from sustainably grown trees.

Curriculum Integration

The Bryan Innovation Lab's programming is a key part of the school's curriculum, and is integrated with traditional classroom work. Efforts are made to use the Lab for all curriculum, not just STEM (science, technology, engineering and math) classes. This effort has led to more collaboration between teachers and it has allowed the Lab to facilitate educational discussions from a variety of perspectives.

The Bryan Innovation Lab curriculum explores the connectedness of the built and natural environments and the impacts they have on each other. Engineering, architecture, the environmental sciences, and the unique interactions of all living and non-living things are investigated. Special emphasis is placed on the maximization of efficiency within the built environment and the minimization of negative impacts through the investigation of natural systems. The school utilizes energy efficient light bulbs, dimmer switches, and motion detection lighting to maximize the building's efficiency, cutting down energy use throughout the day.

The Kitchen Studio and Ipsen Gardens are spaces that help engage students in the production, preparation, consumption, and composting of food. This element of the Lab fosters lifelong healthy decision-making skills and shows students the lifecycle of food from garden, to plate, and back to the garden again as compost. The gardens are tended to by students, harvested for use in school and with local charities, and watered using rainwater collected in the school's two rain barrels. In 2014, these gardens helped supply some of the school lunches and over 800 lbs. of vegetables to FeedMore, a Central Virginia organization that provides comprehensive programs to address hunger. They also served as the source for Edible Education's cooking classes for students in underserved areas.

In addition to the gardens, there are other outdoor learning environments, including wetlands, a rain garden, and a forest. Two water retention ponds with native grasses and plants have been created for natural habitats and are connected by a Blue Bird Sanctuary Trail. These outdoor

areas allow students to observe the wildlife up close. These spaces also provide opportunities for all disciplines to explore and apply natural laws and systems thinking to the interaction of natural spaces and human design. For example, the AP Environmental Studies class uses the native meadows and woodlands to learn about the effects of the school's built environment on the surrounding natural environment's plants, insects, animals and water. Many classes also discuss watershed issues extensively and look at how the parking lot runoff is channeled into the rain garden in order to filter the water.

The Bryan Innovation Lab's visiting innovators program has offered a wealth of knowledge in these areas and opened the door to teachers incorporating lessons in cross-curricular activities in wellness, sustainability, and the environment. The school invites experts in their field to come and talk to the students and teachers. This program has also reached over a thousand people in the community through free events and workshops, with presenters representing companies such as Nike, The Ford Motor Company, The Green Kitchen, Seventh Generation, and many more. In addition to utilizing the knowledge of their visiting innovators, The Steward School has also partnered with the community to help improve education and outreach. These outside partners include the Virginia Commonwealth University Rice Center, Greater Virginia Green Building Council, and the James River Association. Most recently, students helped the Virginia Bluebird Society by collecting data that could be used in their research.

Evaluation of the Process

The key factor in the success of the Bryan Innovation Lab has been the support from the school's Leadership team which includes the Head of School, Associate Head of School, CFO, and Board of Directors. Involving everyone in the decision-making process ensured that the project had widespread support from The Steward School community. It is also important to ensure that all teachers go through a training program to learn how to use a facility like this as a resource. Dedicated Lab staff continues to establish relationships with teachers and encourages research of new technologies and methods. Relationship building helps foster a community of support and allows application of real-world problem solving so that the students can see their ideas come to life.

The investment that The Steward School has made in sustainable programs has initiated a culture change within the school. Standard sustainable practices have taken root not only in the Bryan Innovation Lab, but also as a school-wide effort among students, faculty, and staff. New composting programs have been implemented in the school cafeteria to go along with the mission programming in the Bryan Innovation Lab. All food and placeware is being composted and the compost is used in the school gardens. The recycling bins and garbage cans are now color coded to help prevent contamination when transporting to the dumpsters and the cafeteria now serves food in only compostable products. The school's recycling rate is at 51%, including the compostables diverted from the landfill and the school's composting has increased from .25 tons/ month to 2 tons/month.

There are on-going improvements in reducing the school's electrical energy use and increasing the use of sustainable materials for maintenance and care of the school physical plant. The facilities team has been spearheading many green initiatives like the use of electric carts and one that is solar powered by a panel on its roof. Other maintenance initiatives include purchasing

green floor finishers, inspecting and sealing the HVAC for leaks, and scheduling the HVAC operation to coincide with the school schedule. The floor wax is Green Seal certified and the school has also switched from an oil-based urethane on the hardwood floor in the Varsity Gym to a water-based urethane. The school recently replaced an HVAC unit in the Upper School with a more efficient model and reworked the duct work associated with that particular unit. The School has recently replaced around 120 lights in the colonnade with LEDs to reduce energy consumption. The School is working hard to reduce the number of chemicals used in general and also replacing harsh chemicals with green products whenever possible. The facilities staff seeks out green products when possible and has tested products that have then been integrated into their cleaning regimen.

The Bryan Innovation Lab and its special programming and visiting innovators that bring local and national expertise have created a heightened awareness and commitment on sustainability at The Steward School. As a result there are new clubs, special projects and planning for the school that have engaged the Director of the Bryan Innovation Lab, school leadership, physical plant staff, teachers, parents and local professionals to help support new projects and mission aligned initiatives. These student clubs include a sustainability club named The Bryan Lab Ambassadors, which is a middle school academic club. This student leadership group work on various sustainability projects, including energy audits and efficiency of buildings, carbon pollution study of idling cars on campus, research and data collection for the National Bluebird society, resource allocation and manufacturing research of Nike shoes. In addition there is a Growing Leaders Club for the student gardens that is focused on community engagement, and a nutrition and healthy cooking club. Students from these clubs have also created signage to help spread the message around campus and have been involved in many of the school's other environmental programs as well as health and wellness. Due to the dynamic nature of the program, having multiple groups of individuals involved helps ensure the success of the program as a whole.

The Steward School's environmental efforts have been recognized with numerous awards such as Connect the Dots for Green Schools Challenge, Tricycle Gardens' Golden Trowel, Virginia Association of Independent School's Go Green Virginia Challenge, and a Governor's Environmental Excellence Award. The school has also been recognized as a U.S. Green Ribbon School and Virginia Naturally School.

Continual Improvement of the Program

The Lab is always lining up speakers for the visiting innovators program and looking for more ways to partner with the community and give students an opportunity to participate in meaningful real-world projects with their partners. The Lab is also working with some of their students in order to provide them opportunities to innovate outside of their classroom time. Seniors projects, Middle School Ambassadors, and passionate students who show interest in mission-related topics are mentored to help support student leadership for a wide array of projects. Projects include design and implementation of nature trail and outdoor classroom, organic gardening techniques, botanical illustration, solar energy school planning, and sustainable chicken breeding in an urban setting,

The Lab will continue to find ways to integrate into the school's curriculum and the community as a whole. The Bryan Innovation Lab already has plans to increase their outreach efforts through bluebird workshops, healthy cooking workshops, and educator workshops. Currently the Bryan Innovation Lab hosts 5-10 events a year that are open to the public, delivers programming for field trips to Youth Life Foundation for underserved Lower School students, hosts mission-aligned non-profits and school administration groups, and is involved with the leadership of several community organizations focused on sustainability and environmental education. The facility and programming is a resource not only for the students that attend the school, but for the community as a whole.